404 stores the data shown in FIG. 31(*b*), the control means 402 finds the identification data of the optical disk, the storage position of the optical disk, and the position of the requested data on the optical disk, on the basis of the title "multi05" of the requested multimedia data. In this case, the control means 402 finds that the desired multimedia data "multi05" is recorded in a range from logical block address 0 to logical block address 8911 on the optical disk "disk#3" contained in the slot #11 in the storage shelf.

In step 3, the control means 402 confirms, through the library control means 401, whether the optical disk "disk#3" is mounted in the optical disk drive 503 in the optical disk library unit 500. When the optical disk is not mounted in the drive 503, in step 4, the control means 402 instructs the library control means 401 to convey the optical disk "disk#3" from the slot #11 of the storage shelf 502 to the optical disk drive 503. When the optical disk "disk#3" is already mounted in the optical disk drive 503, the control means 401 proceeds to step 5.

In step 4, the library control means 401 controls the optical disk library unit 500 so that the optical disk "disk#3" in the library unit 500 is conveyed from the storage shelf 502 to the optical disk drive 503. The controller 505 in the optical disk library unit 500 controls the conveyer 504 to take the optical disk "disk#3" from the slot #11 of the storage shelf 502 and insert the optical disk in the optical disk drive 503.

After confirming whether the optical disk "disk#3" is mounted in the drive 503, the control means 402 proceeds to step 5. In step 5, the control means 402 instructs the optical disk library unit 500 to read multimedia data, through the library control means 401, on the basis of the logical block address obtained from the recording content storage means 404. In the optical disk library unit 500, the controller 505 instructs the optical disk drive 503 to read multimedia data from the designated logical block address 0. Then, the server 400 receives the multimedia data read from the optical disk, and the data transmitting and receiving means 403 transmits the multimedia data, through the network 650, to the client 600, followed by step 6.

In step 6, the multimedia data is received by the data transmitting and receiving means 604 in the client 600 and reproduced by the data reproducing means 602.

Next, in step 7, it is judged whether all the data recorded in the logical block addresses 0~8911 are reproduced. When the reproduction is not completed yet, the above-mentioned reading, transmission, and reproduction of the multimedia data are repeated.

In the method for reproducing multimedia data using the prior art network system, when the multimedia data requested by the client is recorded in a single optical disk, this data can be continuously output from the server and continuously reproduced in the client. However, if the requested multimedia data is recorded over plural optical disks, reading and transmission of this data are not performed when the optical disks are exchanged. Consequently, reproduction of the data is unfavorably interrupted due to the exchange of the optical disks.

As described above, the optical disk library unit can store a mass of multimedia data at a relatively low cost. However, in many cases, multimedia data, such as image and voice, is recorded over plural optical disks. Hence, such an interruption in reproduction of multimedia data is an undesirable matter for the multimedia server system.

A description is now given of a case where plural clients request for reproduction of multimedia data from a single optical disk at the same time. It is assumed that two lines of MPEG1 data respectively recorded on an outer circumference and an inner circumference of an optical disk are reproduced using an optical disk drive having the following performances: maximum seek time of about 750 msec; maximum rotation waiting time of about 30 ms; effective transmission rate in a range from 520 KBytes/sec (inner circumference) to 1150 KBytes/sec (outer circumference).

In order to reproduce the two data lines continuously, data of 187 KBytes/sec must be read out from both the inner circumference and the outer circumference. The maximum time required for the reading is calculated as follows:

data reading time=rotation waiting time * 2+inner circumference data transmission time+outer circumference data transmission time+seeking time =30 * 2+187/520*1024+187/1150*1024+750 (ms) =1344 (ms) =1.3 (s)

Since the data reading time exceeds one second, it is not possible to read out data at a sufficient speed for continuous reproduction. That is, in this case, reproduction of multimedia data is interrupted. As mentioned above, the possibility of reproduction in response to plural requests from plural clients to a single recording medium depends on the recording medium and the performance of the device processing the recording medium, i.e., it depends on the speed of reading or writing data on the recording medium. Therefore, when plural clients request, at the same time, reproduction of multimedia data recorded in a high-speed storage device, such as a hard disk (magnetic disk), the storage device can deal with the requests. However, when an optical disk drive having a relatively low data reading speed is employed, if the clients' requests for reproduction of data concentrate on a single optical disk, the reproduction is unfavorably interrupted as described above.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a method for continuously reproducing multimedia data recorded over plural optical disks.

Another object of the present invention is to provide a method for reproducing multimedia data, that can avoid unwanted interruption in reproduction when plural requests for reproduction of multimedia data are received, by checking the requests given to multimedia data recorded on the same optical disk and refusing the request that exceeds the performance of the optical disk drive.

Still another object of the present invention is to provide a multimedia server system that can continuously distribute multimedia data recorded over plural optical disks, to clients, by a server equipped with an optical disk library unit.

A further object of the present invention is to provide a multimedia server system that can avoid unwanted interruption in reproduction when plural requests for reproduction are received, by checking whether or not the requests concentrate on the same optical disk to exceed the performance of the optical disk drive.

Other objects and advantages of the invention will become apparent from the detailed description that follows. The detailed description and specific embodiments described are provided only for illustration since various additions and modifications within the scope of the invention will be apparent to those of skill in the art from the detailed description.

According to a first aspect of the present invention, in a method for reproducing multimedia data recorded over plural optical disks, using an optical disk library unit having